



Comprehensive Monitoring Program Report

An Evaluation of Selected Portions of the TAPS Maintenance Program January 1997-April 1999

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Our Message to Stakeholders

TAPS and JPO

The Trans-Alaska Pipeline System (TAPS) transports nearly 20 percent of the nation's domestically produced crude oil through the unique and fragile environment of Alaska. TAPS is critical to the nation's economy and security. Revenues and investment income from crude oil transported by TAPS account for 80 percent of the State of Alaska's general fund. Since start up in 1977, TAPS has safely transported more than 12 billion barrels of crude oil from Prudhoe Bay to Valdez. The Joint Pipeline Office (JPO), a unique consortium of six State and five Federal agencies, oversees Alyeska's management of TAPS.

JPO's Comprehensive Monitoring Program

JPO's vision is to work proactively with the oil and gas industry in Alaska to achieve safe operation, environmental protection, and continued transportation of oil and gas in compliance with legal requirements. The JPO Comprehensive Monitoring Program (CMP) is intended to influence continuous improvement in Alyeska Pipeline Service Company's management of TAPS construction, operations and maintenance activities. The JPO CMP process is focused on problem prevention rather than reaction, emergency response, and damage control.

CMP reports periodically communicate to JPO stakeholders summaries of past monitoring efforts. The reports revisit critical TAPS audit deficiencies; incorporate concerns raised by TAPS employees and outside interest groups; address high risk activities; verify compliance with laws, regulations, permit conditions, and Grant/Lease stipulations; verify compliance with important internal Alyeska controls such as the quality, safety and environmental programs; and evaluate causal factors and trends related to recent TAPS incidents. Reports have previously covered one of 12 CMP functional topics:

- Alaska Native Employment & Training
- Quality
- Project Performance
- Configuration Management
- Maintenance
- Environmental Protection
- Employee Concerns Program
- Safety
- Risk Management
- Equal Employment Opportunity
- Project Design Operations

This year, the 12 oversight categories are being consolidated into four CMP reports: Operations, Maintenance, Construction/Termination and Culture Change. The emphasis of the CMP will remain unchanged. Coverage of environmental protection, safety, quality, risk and configuration management will be addressed in each report.

About This Report

The JPO is pleased to present An Evaluation of Selected Portions of the TAPS Maintenance Program for 1997-1999 to our stakeholders. While the operation of TAPS will never be risk-free, JPO oversight helps minimize environmental risks, maximize compliance with worker safety and pipeline integrity standards, and improve maintenance performance.

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Executive Summary

The Comprehensive Monitoring Program (CMP) report, An Evaluation of the Selected Portions of the TAPS Maintenance Program January 1997-April 1999, is JPO's seventh CMP report, but the first to evaluate maintenance performance of the Trans-Alaska Pipeline System (TAPS). The status of six maintenance topics is addressed: preventive and workpad maintenance, electrical systems, slope stability, mineral material sites, and mainline valves.

The performance of most TAPS maintenance areas JPO evaluated has either improved or remained the same since the early 1990's. Recent planning, preparation, and execution of mainline valve repair projects achieved a high standard of performance. However, permit and project coordination is an exception, where recent performance has not been as good as Alyeska's previous record.

Compliance. JPO's study of the six maintenance areas included ten stipulations of the Grant and Lease. The aspects of noncompliance contained in this report vary in significance and should be put in perspective. Some aspects of noncompliance have previously existed on TAPS and have been corrected by Alyeska. Only recently did JPO begin reporting them using the CMP process.

Pipeline Integrity. The most significant aspect of noncompliance relates to pipeline integrity. JPO is concerned that two slopes have not been demonstrated to be stable enough to support the above ground pipe in the remote possibility of a large earthquake. JPO and Alyeska are actively studying these slopes. This report presents the interim status of evolving technical evaluations of the slopes and does not suggest a lack of responsiveness on Alyeska's part. If these slopes cannot be shown as safe, civil improvements must be made to fix them. Alyeska and JPO continue to monitor other slopes greater than 10% with no issues noted at this time.

Change Management. Alyeska needs to improve their management of TAPS system changes. Referred to as "change management," this issue was discussed in JPO's February 1999, CMP report about pipeline system operations. However, Alyeska has made progress with new controls that require completion of all updates and revisions before a modified system is turned over to the system operators. They are improving their ability to detect system interactions, documents and parameters.

Principal Conclusions About TAPS Maintenance

- Five of the stipulations evaluated contain some aspects of noncompliance. The areas of noncompliance include slope stability, failure to update records for system changes and civil maintenance, inconsistency between existing conditions and design requirements, and vegetation damage at material sites. Alyeska has efforts underway to address each issue. JPO will verify completed corrections.
- Two slopes at Squirrel Creek are not in compliance with design basis requirements and Stipulation 3.5, Slope Stability of the Grant and Lease. Instrumentation data shows the Squirrel Creek slopes are thawed, resulting in a degradation of permafrost and a

noncompliance with Stipulation 3.9, Construction and Operation. The degree of integrity of the Squirrel Creek slopes under design contingency earthquake conditions is in question and under review by JPO and Alyeska. If these slopes cannot be demonstrated as being safe, civil improvements must be completed. Alyeska has scheduled a risk assessment for this year to evaluate the Squirrel Creek slopes. They recently completed the Pump Station 11 slope risk assessment, which JPO is currently reviewing. Alyeska concluded in their Pump Station 11 risk assessment the probability of a crude oil leak or spill is very remote. Appropriate mitigation actions will follow the review of the risk assessments.

- The Alaska Department of Labor electrical inspector found six National Electrical Code (NEC) violations on TAPS that were within the scope of this review. Alyeska corrected the violations and JPO verified the corrections. Alyeska now requires third party inspection of electrical installations and modifications. If consistently followed, this requirement should prevent future noncompliance with the National Electrical Code.
- Alyeska is meeting their commitments for the mainline valve testing and repair program. Recent planning, preparation, and execution of mainline valve repair projects achieved a high standard of performance. Maintenance goals include
 - 1) testing of 44 mainline valves for internal leak-through in 1998, and testing of the remaining mainline valves by the year 2000, 2) repairing Check Valve 122, and
 - 2) replacing Remote Gate Valve 80. The last two items were completed in 1998.
- Alyeska has not coordinated well with JPO's regulatory agencies during the planning, scheduling, and design of a number of maintenance projects along the TAPS right-of-way. This, coupled with Alyeska's lack of internal coordination, resulted in delays in the permitting and execution of some projects. To correct this problem, Alyeska is clarifying roles and responsibilities and providing additional training to their asset managers.
- Alyeska's maintenance records have only partially documented some workpad and above ground maintenance repairs. This hinders the trending of damage caused by flood, erosion and thawing. JPO considers this to be an instance of noncompliance with Grant and Lease Stipulation 1.18, Surveillance and Maintenance. Although Alyeska disagrees this deficiency is a noncompliance with this stipulation, they are working to improve tracking of civil maintenance repairs.
- New projects were commissioned and turned over to pipeline operators without the necessary preventive maintenance procedures. Other electrical system modifications lacked updated drawings. Alyeska changed procedures to ensure timely completion of preventive maintenance procedures and project records.

Additional Observations and Conclusions

- Alyeska has not met scheduled goals for some parts of the mainline valve program, including below ground valve investigations and the mainline valve maintenance review. Instead, resources were committed to the repair of Check Valve 122 and replacement of

Remote Gate Valve 80. Alyeska plans to accelerate their 1999 schedule to catch up on below ground valve investigations.

- Preventive maintenance work required by regulation was completed within required time frames, which was an improvement over 1996 and 1997 performance. However, JPO discovered that nonregulated preventive maintenance work orders were behind schedule.
- The material sites Alyeska uses are clean and well maintained. Erosion was not evident at any sites. However, not all the material sites met mineral sale requirements. Two sites had excessive vegetation damage and six sites had slopes that exceeded requirements for steepness. Corrections will be verified in 1999.
- JPO incorporated issues from concerned TAPS workers into its monitoring. Two of the TAPS workers concerns were validated after JPO's investigation. One concern involved the maintenance of fire alarm and suppression systems by employees without the appropriate state fire marshal permits. This concern was validated at one pump station. The other concern was that not all electrical work received third party inspections when required. This concern was validated when the six NEC violations were written by the Alaska State Electrical Inspector.
- Alyeska closed the remaining 1993 maintenance related audit action items. The six NEC violations written during this review were recurrences of previously closed audit action items. Additional monitoring by Alyeska and JPO is needed to ensure the corrective action to have a third party inspection of electrical installations and modifications is followed.

1. Purpose, Scope and Background

JPO's past CMP reports have covered pipeline system operations, environmental protection, worker safety, employee concerns, pipeline system projects, and Alaska Native employment and training.

Purpose

All CMP reports evaluate compliance with relevant regulations and the Federal Agreement and Grant and the State Right-of-Way Lease. The 30-year Federal Grant and State Lease for TAPS are both scheduled for renewal by January 2004. Therefore, systematic monitoring of compliance is a central purpose of the CMP. The purpose of this report is to:

- 1) Explain JPO's systematic monitoring approach to the oversight of pipeline system maintenance.
- 2) Describe JPO's approach to monitoring pipeline system integrity concerns, and present the status of slope stability for areas of concern the pipeline traverses, such as the Squirrel Creek, Treasure Creek, Pump Station 11, and Klutina slopes.

- 3) Communicate to the public and higher authorities about Alyeska's performance of maintaining the pipeline system, including electrical and valve systems; and performance maintaining the work pad, material sites, and slopes the pipeline traverses.
- 4) Discuss Grant and Lease compliance issues identified through JPO monitoring of TAPS maintenance.
- 5) Evaluate significant issues raised by TAPS workers and reexamine key deficiencies related to pipeline system maintenance identified in the 1993 TAPS audits.

Scope and Methodology

The scope of this report includes JPO oversight of TAPS maintenance from January, 1997 through April, 1999. JPO conducted surveillances and assessments to evaluate selected portions of Alyeska Pipeline Service Company's maintenance program and formed conclusions based on the assessments. This report focuses on six activities integral to the maintenance of TAPS: 1) electrical, 2) preventive, 3) mainline valve, 4) work pad civil maintenance and surveillance, 5) slope stability, and 6) mineral material sites. This report explains the issues, describes their status, and discusses compliance with the Federal Agreement and Grant and the State Right-of-Way Lease. JPO evaluated these six elements to determine whether Alyeska's maintenance activities were conducted with:

- Minimum environmental impact;
- Conformance to employee safety standards;
- Protection of pipeline system integrity;
- Compliance with the Federal Agreement and Grant and State Right-of-Way Lease;
- Conformance with approved maintenance plans and required documentation of maintenance.

The scope for the six portions of the TAPS maintenance program JPO evaluated are laid out in more detail below.

Electrical Maintenance. The electrical system for TAPS is complex. This system operates and controls the pipeline from Prudhoe Bay to Valdez, including the Valdez Marine Terminal. The electrical system along TAPS includes the sub-systems of lighting, emergency lighting, grounding, heat tracing, lightning protection, and motors. In 1998, a JPO assessment team evaluated electrical system installations at pump stations along TAPS, from Pump Station 1 on the North Slope to the Valdez Marine Terminal to determine whether Alyeska complied with the National Electrical Code.

Preventive Maintenance. In 1997, JPO completed surveillances of selected preventive maintenance areas and identified areas of concern. JPO examined the areas of concern again in 1998, which included required regulatory and mandatory preventive maintenance tasks. JPO reviewed samples of 1997-1998 records to verify whether required preventive maintenance was completed in a timely manner.

Mainline Valve Maintenance. During the time frame covered by this report, JPO reviewed mainline valve maintenance along TAPS. JPO did not review maintenance performance for valves

at the pump stations and the Valdez Marine Terminal. Therefore, valve maintenance in these locations are not included within the scope of this report. Evaluation of valve maintenance for these areas will be addressed in future reports.

Workpad Maintenance. In 1997, JPO conducted surveillances of Alyeska's surveillance, monitoring and maintenance of the workpad, and identified areas of concern that involved the workpad and above ground mainline conditions. JPO looked at these areas of concern again in 1998.

Slope Stability. At the time of TAPS construction, any slopes greater than 10 percent that the pipeline traversed were studied for potential mass movement. Of the slopes studied, Alyeska identified 49 slopes that would require continual future monitoring. The 49 slopes were prioritized according to their greatest potential for geologic movement. Four slopes posed enough of a concern to warrant instrumented monitoring. JPO evaluated the safety and integrity of the above ground pipeline on the four slopes at Treasure Creek, Pump Station 11, Klutina, and Squirrel Creek.

Material Sites. Alyeska uses 76 sites on public lands along TAPS for mineral materials mining. In 1998, JPO inspected 72 of the 76 mineral material sites to determine whether Alyeska complied with Grant and Lease requirements. Four sites were not inspected due to time and access constraints.

Monitoring Maintenance Performance

This is JPO's first CMP report about TAPS maintenance. Before 1994, State and Federal oversight of TAPS focused on surface and subsurface protection, environmental issues, corrosion, oil spill contingency, and land use permitting. JPO had done little monitoring of the maintenance of the pipeline system. In response to identified deficiencies in the 1993 audits of TAPS, JPO expanded oversight to include maintenance of pipeline system hardware. JPO planned the first evaluation of TAPS maintenance in late 1996, began initial field work in 1997, and continued monitoring pipeline system maintenance in 1998.

How This Report is Organized

To aid readers in the understanding of pipeline maintenance issues, this report includes background information about systems and maintenance. Chapter 2, Evaluation of Selected Portions of the TAPS Maintenance Program summarizes the results of JPO monitoring issues and background about the issues. Chapter 3, Federal Grant and State Lease Compliance describes JPO's monitoring results according to the requirements of Grant and Lease stipulations and provisions. Chapter 4 discusses employee concerns and audit action items related to maintenance of the pipeline system. Chapter 5 lays out JPO's planned future work to track identified issues and areas not recently reviewed for evaluation.

2. Evaluation of Selected Portions of the TAPS Maintenance Program

TAPS Electrical Maintenance

During a 1998 assessment, the Alaska Department of Labor electrical inspector found six National Electrical Code violations on TAPS for work performed without the required supervision of a journeyman electrician, and for work that did not receive a third party inspection. Alyeska corrected the violations and JPO verified the corrections.

JPO's review of 129 electrical nonconformance reports written by third party electrical inspectors raised questions about un-inspected work. Alyeska's 1998 decision to inspect all electrical modifications should substantially minimize future National Electrical Code violations.

Modification packages reviewed by the electrical assessment team were incomplete, lacking up-to-date drawings and other documents. This contributes to both the change management deficiencies cited in JPO's previous CMP Operations Report, and the noncompliance with the aspect of Stipulation 1.18.3 concerning modification of records.

The Trans-Alaska Pipeline Electrical System

The TAPS electrical system consists of the pump stations, the pipeline, and the electrical power system at the Valdez Marine Terminal. TAPS electrical systems include the following sub-systems: lighting, emergency lighting, grounding, heat tracing, lightning protection, impressed current cathodic protection, and motors. In addition, some pump station electrical systems include power generation facilities, since commercial power is not available at most pump stations. The Valdez Marine Terminal electrical system also includes a power generation plant.

How Are TAPS Electrical Systems Regulated?

The U.S. Department of Interior, Bureau of Land Management is responsible for monitoring the safety of electrical systems along TAPS. Under the Federal Grant and State Lease, JPO is responsible for safety issues and ensuring that Alyeska is in compliance with all laws and regulations. All TAPS electrical work is required to meet codes and standards specified by the Federal Grant and State Lease. The Alaska Occupational Safety and Health (AKOSH) electrical standards and the National Electrical Code (NEC) standards are the basis for all electrical requirements and inspection criteria for TAPS. The Alaska Department of Labor enforces AKOSH and NEC compliance with two staff members assigned to the Joint Pipeline Office, the safety liaison and the state electrical inspector. Each advises JPO according to their separate areas of jurisdiction.

Who Enforces Which Regulations?

If a violation is identified and an enforcement action becomes necessary under NEC or AKOSH, enforcement can be approached two ways: 1) JPO may enforce an NEC or AKOSH requirement through the Grant and Lease process, or 2) the Alaska Department of Labor can directly enforce the NEC or AKOSH requirement. JPO considers any NEC or AKOSH violations to be instances of noncompliance with the Grant and Lease until they are corrected.

The National Electrical Code (NEC)

NEC is the code used to inspect new electrical systems. The Alaska Department of Labor state electrical inspector enforces all new work, alterations, and modifications in electrical load according to the NEC standards.

The Alaska Occupational Safety and Health Standards (AKOSH)

The AKOSH inspection standard covers existing electrical systems. The Alaska Department of Labor safety liaison enforces safety regulations for existing systems according to the AKOSH standards under the Grant and Lease. Any interpretation of AKOSH is done by the Alaska Department of Labor.

In November 1998, JPO assigned an electrical assessment team, including a state electrical inspector to conduct a review of TAPS electrical systems. The purpose of the assessment was to verify that electrical work and fire alarm and suppression systems on TAPS were in compliance with applicable regulations, codes and Alyeska's Quality Program requirements. JPO selected certain aspects of the electrical systems to look at because 1) employee concerns had been filed concerning NEC compliance, and 2) some electrical systems contained deficiencies that were initially identified in the 1993 audits.

National Electrical Code Compliance. The assessment team reviewed electrical systems at several pump stations and the Valdez Marine Terminal. The team conducted several unofficial grounding checks at these locations and found no deficiencies. (The indeterminate electrical grounding had been a significant issue identified by the 1993 TAPS audits). During the review, JPO identified six electrical items within the scope of this report that were not in compliance with the National Electrical Code. The Alaska Department of Labor state electrical inspector issued six notices of violation to Alyeska for areas of noncompliance with the National Electrical Code. The violations involved electrical work that was completed without the direct supervision of a journeyman electrician, and had not been inspected by a third party inspector. Alyeska corrected the notices of violation and the state electrical inspector verified the corrections.

NEC code compliance has been a continual problem for Alyeska (see chapter 4). This report represents the second time since 1993 that JPO endorsed Alyeska actions to prevent recurrence of NEC violations (the closure of the NEC code violation audit action item preceded this assessment).

Electrical Inspections. The National Electrical Code violations involved electrical work that was not inspected by a third party inspector at some locations. JPO's review did not find any National Electrical Code violations in the areas that had been checked and verified by third party inspection. The third party inspections appeared effective in preventing National Electrical Code violations. A review of Alyeska's nonconformance reports written by third party inspectors revealed 129 instances of National Electrical Code violations had occurred between 1996 and 1998. An Alyeska quality assurance audit led to a decision to require third party inspection of all electrical modifications.

Work and Modification Packages. A work package is a requirement of Alyeska's Quality Program, and includes everything necessary to complete a project. Packages contain project designs, drawings, documentation, and instructions for implementation. JPO reviewed several project packages and found several without current as-built drawings. Other packages lacked complete

inspection checklists and other project documents. The assessment team learned these documents were in the process of being completed. The team also found some packages were not closed out in a timely manner. This finding is not individually significant, however, considering Alyeska's deficiency in managing change, there is a need to improve compliance with the aspect of Stipulation 1.18.3 that requires management of change. (Electrical modifications are system changes and are part of change management).

Work Orders. JPO investigated an employee concern that a specific project failed to have a work order for electrical work required by Alyeska's Quality Assurance Program. JPO found completion of the work order complied with the Quality Assurance Program and did not validate this concern.

State Fire Systems Work Permits. JPO received another employee concern involving workers who had designed, installed and maintained TAPS fire alarm and suppression systems. The workers lacked the necessary permits from the state fire marshall. All inspected locations met state fire marshall regulations concerning permits, with the exception of Pump Station 7. An individual that had worked on the fire suppression system at Pump Station 7 only had a permit to work on fire alarm systems. Although not required by the state fire marshall, but for purposes of consistency, the pipeline manager then directed Pump Station 7 to follow overall TAPS policy and secure the necessary fire system permits. JPO will follow up with surveillances to validate Alyeska's directive and verify that fire system permits were obtained.

Electrical Administrator. Electrical administrators have the overall responsibility for certifying that all electrical installation and repair work complies with the National Electrical Code. Alyeska has two electrical administrators, one for the Valdez Marine Terminal and one for the pipeline system. Alyeska's electrical administrators have the responsibility of making sure all electrical work completed by Alyeska employees complies with the National Electrical Code.

The electrical administrator positions complied with State of Alaska requirements. However, JPO observed that the role of Alyeska's electrical administrator was not clearly defined. There was a misconception within Alyeska about the exact responsibilities of the electrical administrator. Many Alyeska employees assumed the electrical administrator's primary role was inspecting all electrical work on TAPS; however, each company performing electrical work is required to provide their own electrical administrator for the oversight of any electrical work completed by that company. Alyeska clarified their master specification requirement to specify that, although the electrical administrator is responsible for all electrical work completed by Alyeska's electricians, the electrical administrator does not have the responsibility for defining inspection criteria for electrical work packages designed on site.

TAPS Preventive Maintenance

New projects were commissioned and turned over to pipeline operators without the necessary preventive maintenance procedures. Other electrical system modifications lacked updated drawings. Alyeska changed procedures to ensure timely completion of preventive maintenance procedures and project records.

Preventive maintenance work required by regulation was completed within required time frames which was an improvement over 1996-1997 performance.

Preventive maintenance tasks which are not regulatory or mandatory, but are important in protecting pipeline safety and integrity were often overdue and backlogged. Alyeska reported that 98% of these preventive maintenance tasks were completed within 60 days of the original due date, eliminating the concern they weren't being performed.

Preventive Maintenance. Preventive maintenance is the service, inspection, and performance of function checks of the pipeline system on a scheduled basis. It is intended to prolong equipment life and avoid in-service failure. Some areas of preventive maintenance are mandatory and are required to be performed on a specific schedule set by State or Federal regulatory agencies.

JPO began active monitoring of preventive maintenance in late 1996 after reviewing Alyeska trending reports which cited preventive maintenance backlogs. JPO's initial assessment focused on those TAPS preventive maintenance tasks required by regulation. Alyeska's preventive maintenance records reside in their electronic tracking system, Passport. Passport generates work orders for preventive maintenance tasks. When work orders are generated, each has a required due date for completion of the preventive maintenance task.

Alyeska's Scheduling and Tracking of Preventive Maintenance Tasks

Alyeska categorizes maintenance tasks and assigns each category a level of importance, using priority codes in Passport, the electronic data base Alyeska currently uses to track TAPS maintenance work. Preventive maintenance tasks are grouped by five priority codes:

- Priority 01: Emergency work...requires immediate action.
- Priority 02: Reactive work... not known, or not scheduled fourteen days in advance of implementation date.
- Priority 03: Non-deferrable preventive maintenance tasks... regulatory and mandatory preventive maintenance tasks that may not be deferred.
- Priority 04: Routine preventive maintenance tasks... routine tasks that are not regulatory driven, and may be deferred.
- Priority 05: Lowest priority preventive maintenance tasks... these may be deferred.

JPO's 1996-1997 monitoring found several Priority 03 tasks that were being deferred. Some of these were neither regulatory or critical, but were still being coded as Priority 03 tasks. Alyeska implemented corrective and preventive actions.

Priority 03 PM Tasks. Required preventive maintenance work orders are categorized as Priority 03. A review of Priority 03 preventive maintenance items revealed they were completed within required time frames, except those that could not be completed without TAPS being shut down. This was an improvement over past performance for completion of Priority 03 preventive maintenance tasks.

Priority 04 PM Tasks. JPO also reviewed Priority 04 preventive maintenance tasks. These tasks are not regulatory or mandatory, but are important to safety and integrity of the pipeline. Alyeska queried Passport to obtain information for JPO that revealed 831 tasks were overdue for Priority 04

preventive maintenance line-wide. Alyeska's response to JPO's assessment findings stated that 98% of Priority 04 preventive maintenance tasks were being completed within 60 days of the original due date. Alyeska noted, and JPO does not disagree that many of these should be coded to Priority 05. Alyeska plans to designate less important preventive maintenance work orders as Priority 05 to better prioritize the work. Better use of the Priority 05 tasks should improve efficiency by better separating the less critical from the more critical tasks. JPO closed this finding and will continue to monitor the status of this work during 1999.

Change Management Related to Preventive Maintenance. JPO found new projects were turned over and accepted by pipeline operating personnel without preventive maintenance procedures or project records. These deficiencies could be prevented by effective "change management" as discussed in JPO's recent Operations CMP Report. As mentioned above, Alyeska revised their TAPS engineering and quality assurance manuals to ensure that preventive maintenance procedures and project records are provided to the operators before turning the projects over to pipeline operating personnel. Asset Team Leads (lead persons at pump stations and adjacent sections of TAPS) are currently not accepting ownership of completed modification projects without all the preventive maintenance procedures or project records. JPO concurs that these preventive actions should address incomplete project turnover. JPO's project monitoring for 1999 will concentrate on verifying whether system modifications have accurate drawings, correct procedures and current specifications.

What is "change management?"

Change management on TAPS refers to those processes, controls, and records used to track system changes used to safely operate and shut down the pipeline. When a system is changed, all the relevant drawings, maintenance procedures, part lists, test procedures and operating instructions are revised prior to operation. Change management ensures that no test routine, system interaction, calibration specification, or other parameter escapes evaluation--something that is too easy to do on the complicated technology that comprises TAPS.

Corrective and Supplemental Work Orders. JPO reviewed Passport data containing overdue corrective and supplemental work orders. A supplemental work order is initiated to correct deficiencies found on other priority work orders. Corrective work orders are separate from preventive and supplemental work orders, in that they correct deficiencies not previously tied to any other work order. The data base identified 1,673 overdue work orders. Many of these open work orders were not critical and were unrelated to preventive maintenance. Alyeska responded they would define a realistic backlog and reduce the number of outstanding work orders. Alyeska has allocated resources to reduce the number of outstanding Priority 04 preventive maintenance tasks and the backlog identified in the Passport system. The CMP addresses work orders related to safe operation and shutdown of TAPS and excludes the myriad business tasks that Alyeska must manage.

TAPS Mainline Valve Maintenance

Alyeska is meeting its commitments for the mainline valve testing and repair program. Recent planning, preparation, and execution of mainline valve repair projects achieved a high standard of performance. Maintenance goals included

- tests of mainline valve performance to check for internal leak-through,
- repairing Check Valve 122, and 3) replacing Remote Gate Valve 80.

Mainline valve sealing performance for all critical valves is now known or ?determinate? for the first time since construction. The performance of all mainline valves will be determined by the year 2000.

Alyeska is behind their schedule for below ground investigations and the mainline valve maintenance review. They plan to accelerate their 1999 schedule to work on below valve investigations.

The TAPS Mainline Valve Maintenance Program

What's the Purpose and Function of the Valves Along TAPS?

The Trans-Alaska Pipeline System includes a number of valves that can isolate sections of pipeline in the event of a leak. Properly operating valves are important elements in pipeline oil spill prevention and response. Mainline ?block valves? are positioned at strategic locations along the main pipeline to block the flow of oil and isolate sections of the pipeline. A total of 177 mainline block valves are situated along TAPS to control and block the flow of oil when necessary. The mainline system includes 81 check valves and 96 gate valves, of which 86 are above ground and 91 are below ground. The remote gate valves require communication from the pipeline controllers in Valdez to close or open and can stop pipeline flow in both directions. Check valves operate one way and prevent the reverse flow of oil. They are designed to be held open, either mechanically or by flowing oil and to drop closed automatically when oil flow stops or is reversed.

The Importance of Valve Maintenance

Valves must be maintained to 1) minimize and limit potential spills, 2) provide overpressure protection, and 3) isolate sections of the pipeline. Alyeska developed a valve maintenance program consisting of testing and evaluating valves and making any necessary repairs or replacements. The primary objective of the mainline valve maintenance and testing programs is to assure the sealing capability of TAPS mainline valves, by testing and repairing all valves as necessary. Repair options consist of removing and replacing the entire valve, repairing or rebuilding the valve in place, or using sealing agents to re-establish the seal. Valve sealing standards are necessary because valves may lose their ability to seal over time. Minimum valve sealing performance standards are unique for each block valve depending on the valve's location along the pipeline.

The Valve Maintenance Program. Until 1996, the key objective of Alyeska's maintenance for remote gate valves was to keep the valves operating and functional. This means mainline valves would open and close on command when controlled either manually or from the Operations Control Center at the Valdez Marine Terminal. In 1996, Alyeska conducted a review of their mainline valve maintenance program. The review determined improvement was needed in valve preventive maintenance, inspection, operational testing, and personnel training. Several things needed to be done, including 1) a risk assessment, 2) integrity testing of the valves, and 3) development of an aggressive valve sealing plan. After the review, Alyeska modified their valve maintenance program to evaluate the condition of TAPS mainline valves. In 1998,

Alyeska developed an overall TAPS valve maintenance management plan. The intent of this maintenance program was to inspect and test valve operation, including sealing capabilities and operation of valve actuators, with the goal of ensuring reliable operation of valves.

Mainline Valve Testing Program. Alyeska began testing the performance of mainline valves in 1996. They confirmed Remote Gate Valve 60 would not seal completely when it closed. Information from performing winterization maintenance suggested the problem might not be limited to Remote Gate Valve 60. Corrective maintenance procedures were attempted, including sealants to the seat surface through internal passages designed for this purpose. This failed to mitigate the sealing problems. Four agencies entered into a memorandum of agreement with Alyeska, referred to as the Valve MOA, which established a valve testing program to determine the sealing performance of mainline valves and require as necessary interim oil spill contingency plans. Valve testing identified two valves, Remote Gate Valve 80, and Check Valve 122 that had a greater leak-through rate and lower performance than Remote Gate Valve 60. In 1998, Remote Gate Valve 80 was replaced and Check Valve 122 was repaired in place. Remote Gate Valve 60 is currently scheduled for 1999 repair. Although additional testing has identified valves with some leak through, the performance degradation is so slight they may not be candidates for repair and replacement.

Why Is It Important to Winterize Mainline Valves?

The purpose of winterization maintenance on remote gate valves is to inhibit internal corrosion. During this maintenance procedure, water is drained from the valve body and glycol, an antifreeze solution, is pumped in. When internal valve seals perform properly, the contents of the valve body can be drained without the loss of oil from the pipeline. If an internal seal does not perform properly, oil can flow directly into the valve body.

Annual Winterization Finds Valve Problems

During their annual winterization maintenance, Alyeska noted that many mainline gate valves had internal sealing problems. More than half of the remote gate valves showed pressure in the valve body during winterization and testing, which suggested possible internal seal leakage. Alyeska has been defining actual operating performance of all mainline valves.

The valve maintenance program and the mainline valve testing program are subsets of the overall TAPS valve program. The development of the TAPS valve program which integrates elements of the TAPS quality program, maintenance program, configuration management, operations and documentation is a landmark effort for Alyeska. Within Alyeska, different disciplines with different perspectives provide tools and linkages between programs and disciplines to address hardware issues or operations issues in a more comprehensive manner. Alyeska is meeting their goals and commitments with the high priority, high visibility items related to valve maintenance, tests of mainline valve performance with respect to leak through, repairing Check Valve 122 and replacing Remote Gate Valve 80. The preparation and execution of the valve repairs achieved a very high standard.

Mainline Valve Maintenance and Repair Projects

In September 1998, TAPS was shut down for two extensive valve maintenance projects. One mainline valve was repaired and another was replaced. Alyeska estimated a down time of 30 to 36 hours, but was able to restart the pipeline within 29 hours after valve work was completed. The planning, preparation and execution of the valve repair and replacement projects achieved a high standard.

Remote Gate Valve 80 was removed from the mainline and replaced with a refurbished gate valve. After Alyeska removed the valve from the pipeline system, the internal parts of the valve were inspected and extensive seat and gate damage was observed. The damage was most severe on the downstream side of the gate and seat. Remote Gate Valve 80 was successfully replaced ahead of schedule.

Check Valve 122 had experienced internal leak through of oil. Damage to the valve parts was minimal, and it is believed that the debris and sludge found at the bottom of the check valve was the reason why it had not sealed properly. It was repaired in place by replacing the seat ring and clapper assembly.

Remote Gate Valve 60 will be removed from the mainline in 1999 and replaced with a refurbished gate valve.

Alyeska has not met the goals for addressing other significant valve concerns, including the below ground valve investigations and the mainline valve maintenance review. This delay is partially due to the reassignment of key personnel in support of Check Valve 122 and Remote Gate Valve 80 projects. While these efforts are important for maintaining integrity of the system in the long term, slippages in these schedules do not result in immediate or significant threats to TAPS integrity or safety. The valve maintenance review will benefit from examination of the components of Remote Gate Valve 80 and Check Valve 122. Maintenance procedures will improve as more is understood about the mechanisms that cause valve deterioration. Full commitment of adequate resources will be needed for the future progress of the TAPS valve program.

TAPS Workpad Surveillance, Monitoring, and Maintenance

Alyeska's maintenance records only partially documented some workpad and above ground maintenance repairs. This hinders the trending of damage caused by flood, erosion and thawing. JPO considers this to be an instance of noncompliance with Grant and Lease Stipulation 1.18, Surveillance and Maintenance. Although Alyeska disagrees that this deficiency is an area of noncompliance, they are working to improve tracking of civil maintenance repairs.

JPO found that instrumentation along the pipeline that monitor and collect data was not being maintained and repaired. Alyeska is currently working to replace malfunctioned monitoring instrumentation.

Alyeska has not coordinated well with JPO's regulatory agencies during the planning, scheduling, and design of a number of maintenance projects along the TAPS right-of-way. This, coupled with Alyeska's lack of internal coordination, resulted in delays in the permitting and execution of some projects.

What Is the Purpose of the Workpad?

The workpad is the portion of the TAPS right-of-way which encompasses 1) the gravel fill on which the pipeline is located, 2) the travel lane adjacent to the pipeline, and 3) additional fill required for construction. The workpad was constructed to provide a traffic surface for access and work platforms for the heavy equipment required to install the pipe. It serves as the primary means of access for doing work and inspections to both prevent and respond to any oil or chemical spills on or near the workpad, pipeline, and supporting facilities. The workpad width varies, depending on the pipeline mode, terrain, and soil conditions. Maintaining the workpad is important to provide access to the pipeline system.

JPO conducted surveillances and assessments in 1997 and 1998 to determine whether Alyeska's work pad surveillance, monitoring and maintenance programs complied with the Grant and Lease. JPO conducted surveillances at the pump stations, reviewed the work pad and above ground mainline conditions, reviewed the annual line walk data from 1997-1998, and reviewed right of way surveillance system records. Some of the records JPO reviewed in Passport lacked necessary detail of workpad maintenance work Alyeska had completed. JPO found problems with the record keeping of up-to-date workpad maintenance records and coordination of the project permitting process.

Up-To-Date Workpad Maintenance Records. Section 9 of the Grant and Lease requires Alyeska to maintain quality records of natural resource rehabilitation and tangible property repairs. Grant and Lease Stipulation 1.18 requires complete and up-to-date records on maintenance performed along the pipeline system. Some surveillances had documented actions taken but the results were inconsistent. Much of the work pad maintenance is done by Alyeska contractors using a blanket work order for each asset area. The maintenance coordinators for each asset area should provide descriptions of the task to be done under the blanket work order, but some maintenance coordinators did not provide the description. Without the description of each task completed under the blanket work order, it is difficult to track what work pad maintenance has been done, and even more difficult to put today's civil maintenance problems in context with historical performance.

Project Permitting Process. Coordination of projects and permitting is an area where Alyeska has typically excelled. During the past year, however, Alyeska did not coordinate the permitting process with JPO and regulatory agencies during planning, scheduling and design of some maintenance projects. In addition, some of Alyeska's internal teams were not involved in the project development process. JPO had requested Alyeska on several occasions to contact regulatory agencies about potential projects well ahead of proposed construction. Alyeska's lack of overall coordination resulted in delays issuing the permits.

Good coordination and advance planning for the project permitting process is beneficial for Alyeska, JPO, and the regulatory agencies. Projects must be planned and scheduled with JPO and regulatory agencies to ensure both protection of pipeline integrity and the environment. Alyeska did not consider protection of environmental values during the earliest stages of project feasibility and

design for a planned project along the Dietrich River at Remote Gate Valve 34. JPO's concern is the protection of pipeline integrity and the environment. The lack of consideration of environmental values forced JPO to weigh issues of pipeline integrity against avoidable environmental damage. This resulted in fewer measures to mitigate adverse environmental impacts in Alyeska project plans and specifications. To ensure pipeline integrity, JPO granted Alyeska approval to use temporary erosion control measures at Remote Gate Valve 34 on the Dietrich River.

The Importance of Advance Planning for Project Permitting

Workpad erosion is occurring along the Dietrich River, next to Remote Gate Valve 34 at pipeline milepost 185. The erosive forces of the river are undercutting the bank and threatening the workpad surrounding the Remote Gate Valve 34 control facility. JPO granted approval for Alyeska to use temporary erosion control measures. Alyeska plans to divert the main channel of the Dietrich River to install a riprap revetment to prevent further erosion. JPO requested Alyeska to complete the repairs in the fall of 1998. However, Alyeska did not apply for the necessary permits until late February 1999. The permits were originally delayed for several months due to fishery issues, which have been addressed. Alyeska will build the planned revetment before the Dietrich River thaws, which is the time of concern for further erosion.

Why Is the Timing of Maintenance Projects Along Streams So Important?

The Alaska Department of Fish and Game is concerned about the effect of winter construction in streams that support over-wintering of fish populations. Winter is a critical and sensitive time for survival of fish populations in arctic streams. To survive the extreme cold, fish metabolism slows to a state of dormancy, where oxygen decreases to lower levels. Minimal disturbance to this winter fish habitat at this time is critical to survival of fish in northern areas. The part of the river where Alyeska plans to work was determined to be a critical over-wintering fish habitat by the Alaska Department of Fish and Game.

Controlling and Preventing Soil Erosion

Soil erosion is a naturally occurring geologic process, which Alyeska may not always control or prevent, but requires appropriate action to protect the pipeline system. The erosion that occurred along the banks of the Dietrich River, allowed the river to come within 10 feet of Remote Gate Valve 34. Once discovered, this situation required Alyeska to immediately respond to protect the river bank from further erosion, and protect the gate valve facility. The Grant and Lease require that Alyeska conduct surveillance and monitoring to avoid, control, or minimize erosion along the pipeline corridor, especially near water bodies where erosion potential is the highest.

JPO Surveillance of Erosion for Grant and Lease Compliance

In 1998, JPO conducted surveillance and engineering reviews of erosion and its resulting effects in the areas near Pump Stations 1 and 3. The areas included 1) the route of the fuel gas line from Pump Station 1 to Pump Station 4, 2) a washout of a culvert on Coldfoot Hill, and 3) effects of river and floodplain erosion on the Dietrich River, Chena River, Sag River, Marion Creek, Hess

Creek, Jarvis Creek, Darling Creek, Miller Creek, Tazlina River, Tsina River, Glacier Creek, and Abercrombie Creek. Before making repairs in these natural areas, Alyeska must obtain land use and environmental permits.

Alyeska uses management control guidelines for the repair of erosion: 1) Monitoring Procedures (MP-166), Surveillance and Monitoring Manual (MS-31), the design basis, and the 49 Code of Federal Regulations. These guidelines are used for inspection of rights-of-way and crossings under navigable waters. A test of Alyeska's compliance in addressing erosion problems will be their success in planning, permitting, funding and implementing necessary repairs in response to the natural occurrence of erosion. Future monitoring will ensure erosion problems are fixed as they occur. Monitoring Alyeska's response to the specific erosion problems identified in 1998 will be a part in JPO's work planning for 1999 and 2000.

Maintenance Manual Revisions. JPO's workpad assessment noted Alyeska revised the critical manuals that affect surveillance, monitoring and maintenance: Surveillance and Monitoring Manual (MS-31), Monitoring Program Procedures (MP-166), and Maintenance System Manual (MP-167). Alyeska committed to use their Passport system to record maintenance work activities, and conduct action tracking. JPO's concern has been Alyeska's inability to historically track completed work for TAPS maintenance programs. Alyeska's use of Passport to document maintenance work should satisfy JPO's concern in this area.

Changes to the MP-166 and MP-167 Manuals will also rely on the Passport system to provide a single, integrated information management system that includes work materials, documentation, and engineering change management to achieve maintenance objectives.

JPO believes some improvement is needed in Alyeska's maintenance of the instruments along the pipeline that

Since major workpad repairs are documented by project records, are small repairs covered? Maintenance work done under blanket work orders was not adequately documented in Passport. Trends on cumulative maintenance work can predict problems or indicate complications.

Why hasn't this been a practical problem before?

Because this knowledge was possessed and trended by key right-of-way maintenance managers formally called pipeline and civil maintenance (P&CM) managers now called maintenance coordinators. JPO's concern is that as individuals leave, the institutional memory of maintenance work will be lost due to lack of documentation monitor and collect data. Instrumented data is essential as it provides analysts with critical information to identify problems before they become serious or unmanageable. It is important to maintain this instrumentation in good working order. Specific instruments include the piezometers on the back slopes of the Valdez Marine Terminal, monitoring rods at mainline refrigeration units, inclinometers on steep slopes, thermistor strings to measure ground temperature, and other measuring instruments. JPO concluded that Alyeska's lack of complete and up-to-date documentation of maintenance work and not keeping field instrumentation in working order constitutes a noncompliance with Stipulation 1.18. (See chapter 3, Grant and Lease Compliance).

Slope Stability

Instrumented and monitored pipeline slopes at Treasure Creek and Klutina Hill meet design basis criteria.

The Pump Station 11 slope is not in compliance with design basis requirements and Stipulation 3.5, Slope Stability of the Grant and Lease. The dynamic factor of safety, or earthquake contingency for this slope is less than 1.0. JPO is currently reviewing the Pump Station 11 risk assessment. Alyeska agreed to submit a request for a design basis change for the static factor of safety on the Pump Station 11 slope.

The slopes at Squirrel Creek are not in compliance with design basis requirements and Stipulation 3.5, Slope Stability of the Grant and Lease. Instrumented thermistor data shows the Squirrel Creek slopes are thawed, resulting in a degradation of permafrost and a noncompliance with Stipulation, 3.9, Construction and Operation. The degree of integrity of the Squirrel Creek slopes under design contingency earthquake conditions is in question and under review by JPO and Alyeska. If these slopes cannot be demonstrated as being safe, civil improvements must be completed. The slope stability issues are being aggressively worked by both Alyeska and JPO. Alyeska has scheduled a risk assessment later this year to evaluate the Squirrel Creek slopes.

The Importance of Design Basis and Factors of Safety for Slope Stability

What is the Design Basis?

The design basis is a compilation of current engineering criteria for facilities within the Trans-Alaska Pipeline System (TAPS). These criteria determine the engineering standards for the facilities that comprise TAPS. Design basis standards represent quantitative and qualitative values for facilities and have been agreed upon by the TAPS owners, Alyeska Pipeline Service Company, and the Joint Pipeline Office. The design basis serves as a collection of technical standards and requirements for the purpose of construction, operation and maintenance of the pipeline system.

How is the Design Basis used for slope stability?

The pipeline traverses many slopes along its route. Some of these slopes are steep, and some have ice-rich soils or other soil conditions that make them susceptible to down slope movement. The TAPS design basis considers all slopes greater than 10% significant slopes. These slopes must be designed to withstand a design contingency earthquake, which is a rare earthquake of extreme magnitude which may occur at intervals of several hundred years. For static conditions, the calculated factor of safety for the slope must be at least 1.5. For dynamic conditions, the slope must be capable of resisting dynamic stresses with a factor of safety no less than 1.0, or total slope movements no greater than 5 inches.

Are the slopes safe?

At the present time JPO questions the degree of integrity of the Squirrel Creek and Pump Station 11 slopes. The Squirrel Creek risk assessment will address this issue.

Is Alyeska working this issue aggressively?

The slope stability issues are being aggressively worked by both Alyeska and JPO. Nothing in this report should suggest lack of responsiveness by Alyeska. Rather, this report presents a mid-course status report of an actively, evolving technical evaluation.

Monitoring Slope Stability. At the time of TAPS construction, any slopes greater than 10% that the pipeline traversed, were studied for the potential occurrence of mass movement. Of the slopes studied, Alyeska identified 49 slopes that would need continuous future monitoring. Four of the 49 monitored slopes posed enough of a concern for Alyeska and JPO to warrant instrumented monitoring. Alyeska maintains detailed historical records of their monitoring of these slopes. JPO evaluated the safety and integrity of the above ground pipeline for slopes at:

1) Treasure Creek, 2) Pump Station 11, 3) Klutina, and 4) Squirrel Creek. The question JPO addressed was whether the pipeline is safe on these slopes, under both static and dynamic factors of safety. For static conditions, the calculated factor of safety for the slope must be at least 1.5. For dynamic conditions, the slope must be capable of resisting dynamic stresses with a factor of safety no less than 1.0, or total slope movements no greater than 5 inches.

JPO's review of actual ground conditions based on surveillance, literature reviews, a risk assessment of the Pump Station 11 slope, and a recent report on slope stability by Alyeska shows that slope stability depends on the soil remaining in a frozen state. Golder Associates Inc., Alyeska's contractor, determined the Treasure Creek and Klutina slopes remained frozen, but the Pump Station 11 and Squirrel Creek slopes have partially thawed since TAPS construction. JPO concluded the above ground pipe on the Treasure Creek and Klutina slopes is safe. Factors of safety for Treasure Creek and Klutina slope continue to meet design basis requirements because these slopes remain frozen and stabilized. However, Alyeska reports show the factors of safety for the Pump Station 11 and Squirrel Creek slopes do not meet design basis requirements.

Squirrel Creek Slope Stability. JPO's field surveillance of two Squirrel Creek slopes along with the cumulative evidence in the Golder Associates report, suggest that slope movement is occurring and will continue to occur in this area. Alyeska's most recent report on slope stability shows the calculated dynamic movement for Squirrel Creek's south slope is seven inches. This exceeds the design basis requirement of five inches, and therefore does not meet design basis requirements for the dynamic factor of safety. The static factor of safety is marginal, and the dynamic factor of safety does not meet design basis requirements, since the Squirrel Creek slopes have thawed from the time of TAPS construction. This represents a changed geotechnical environment from the original design basis.

The factors of safety for the Squirrel Creek slope are less than the design basis requirements, and therefore do not comply with Stipulation 3.5 of the Federal Agreement and Grant and State Right-of-Way Lease (discussed in chapter 3). JPO requested Alyeska to conduct a risk assessment for the Squirrel Creek slopes to clarify additional mitigation possibilities. Alyeska recently agreed to do a risk assessment later this year, preceded by a meeting with JPO to visit the slopes.

The Importance of Slope Stability for TAPS

What Causes Slope Failure?

Slope failure is normally caused by a combination of factors, including slope angle, amount of soil moisture, and gravity. Although some slope failure is attributed to the amount of moisture the soil is able to hold before giving way, slope failures do occur with dry soil conditions on excessively steep slopes. In Alaska, an additional factor is permafrost which normally stabilizes frozen soils on steep slopes. When permafrost thaws on steep slopes, the soil becomes moisture-laden, less stable, and gravity moves it down slope. Another factor is seismic activity or a design contingency earthquake, which can induce slope failure in some areas under certain conditions.

Squirrel Creek and Pump Station 11 Slopes: Factors of Safety

Slope stability is an issue on the Squirrel Creek slopes because the calculated factors of safety are not in compliance with the design basis requirements of 1.5 for the static, and 1.0 for the dynamic factors of safety. The factor of safety is a measurement of the degree of safety on a slope. A safety factor of 1.0 means the natural forces pushing down slope equals the resisting forces. The Pump Station 11 slope static factor of safety is 1.3 and the dynamic factor of safety is less than 1.0, neither of which meets the design basis standard.

How Did JPO Approach the Slope Stability and Design Basis Issues?

The approach to evaluating the integrity of the Treasure Creek, Pump Station 11, Klutina, and the Squirrel Creek slopes was similar to how JPO studies other issues:

- Determine whether the slopes and above ground pipe are safe.
- Conduct detailed surveillance and assessment work to identify significant findings to be resolved.
- Resolve findings using the risk assessment process.
- Require the system to comply with the design basis or adjudicate engineering supported waivers or modifications.
- Verify that corrective and preventive actions have been completed.

Pump Station 11 Slope Stability. Alyeska performed a risk assessment for the slope at Pump Station 11. The objective of the risk assessment was to determine whether the slope immediately north of Pump Station 11 posed an unacceptable level of risk for the continued safe operation of the pipeline. The items that were considered during the risk assessment were 1) potential hazards that could cause the slope to fail, 2) probable results of those failures, and 3) possible options that could prevent the failures or mitigate the consequences. The risk assessment presented an analysis of three scenarios of slow slope creep, a minor slope failure affecting less than 180 feet of pipe, and a major slope failure affecting more than 180 feet of pipe. In all scenarios, Alyeska's study team concluded that the possibility of a spill or leak of crude oil was very remote. JPO is currently reviewing the final risk assessment received from Alyeska in March 1999.

What does "very remote" really mean?

Very remote means the occurrence of some event is possible but not very probable. For example, the occurrence of earthquakes is often viewed as possible events with varying degrees of probability of occurrence depending on magnitude, location and other factors. The design basis for the TAPS pipeline system contains considerable information regarding the potential and likelihood

of occurrence of various magnitude earthquakes. TAPS was designed for the occurrence of large design contingency earthquakes.

Alyeska also concluded that continued monitoring and maintenance was necessary. Further, any maintenance or project work conducted on the Pump Station 11 slope would need a prior engineering evaluation. JPO suggested that Alyeska conduct a study of how to improve drainage on this slope. JPO also recommended that Alyeska request a waiver from the design basis to account for the discrepancy of the static safety factor of 1.3 for the Pump Station 11 slope that doesn't meet the specified value of 1.5. Alyeska recently agreed to prepare and request a waiver and plans to enter it into the design basis for future reference, once it is granted. Alyeska committed to completing the update of the design basis by June 30, 1999.

Continued Monitoring and Maintenance. JPO accepted Alyeska's commitment to implement their 1998-1999 slope stability work plan. Alyeska agreed with JPO that monitoring and continued maintenance of the above ground pipe on all the slopes at the Pump Station 11, Squirrel Creek, Klutina, and Treasure Creek locations is necessary to ensure the safety and integrity of the pipeline.

TAPS Mineral Material Sites

The material sites Alyeska uses are clean and well maintained. Erosion was not evident at any of the sites. However, not all the material sites met regulatory requirements. Two sites had excessive vegetation damage, and six sites had slopes that exceeded requirements for steepness. JPO requested Alyeska to submit plans for restoring these sites and corrections will be verified in 1999.

What are Material Sites and What Are They Used For?

Alyeska has mining contracts to use sites along the pipeline right-of-way to obtain granular material for maintenance and construction. The U.S. Bureau of Land Management and the Alaska Department of Natural Resources require Alyeska to follow a Mining and Reclamation Plan, that is attached to every material sale mining contract. Additionally, Alyeska must follow the terms of any accessory permits that may be required, depending on the particular site. The removal of gravel and related construction materials from non-permitted locations is not allowed. The sites must be mined and maintained according to agency regulation. Alyeska uses the materials for:

- New construction
- Repairing the pipeline work pad to fill cracks, depressions, and washouts.
- Bedding and road surface materials for building and maintaining access roads.
- Flood damage control and revetment projects for rivers and streams along the pipeline.

State and Federal inspections are required annually for all active material sites along the TAPS corridor. Both the U.S. Bureau of Land Management and Alaska Department of Natural Resources administer material site programs for lands under their jurisdiction, including sites along TAPS. Alyeska uses 76 material sites on public lands along TAPS for materials mining, and of those, 43 are located on Federal land and 33 are under State jurisdiction.

In July and August 1998, JPO inspected the material sites along TAPS to determine whether Alyeska complied with the Grant and Lease. Stipulation 2.6 of the Grant and Lease specifies that 1) the permittee must apply to purchase gravel and other construction materials taken from public lands, 2) submit a mining plan for removal, and 3) obtain written approval of the Federal

Authorized Officer or the State Pipeline Coordinator at JPO for removal of all materials. Material site boundaries are required to blend with surrounding natural land patterns, and soil erosion and vegetation damage must be prevented.

JPO inspected 72 of the 76 active sites Alyeska uses to mine material. Four of the sites were not inspected due to time and access constraints. JPO assessed whether Alyeska followed the provisions of the material sale contracts and the mining and reclamation plans for each site. The assessment included surveillances from Prudhoe Bay to the Valdez Marine Terminal. JPO inspected each material site and looked at the associated records at the pump stations and concluded the material sites Alyeska uses are clean and well maintained. Erosion was not evident at any of the sites. However, not all the material sites met material sale requirements. Two sites had excessive vegetation damage, and six sites had slopes steeper than allowed by the mining and reclamation plans.

Steep Slopes. JPO found six sites near Pump Stations 5 and 9 where Alyeska may have violated their mining and reclamation plans. All sites had side slopes steeper than the maximum measurement listed in the requirements of the mining plans. JPO recommended that Alyeska bring the slopes of the six sites into compliance with the current mining and reclamation plans. The noncompliance with the mining plans constitutes a noncompliance with the material sale contracts.

Excessive Vegetation Damage. Two sites near Pump Station 5 had excessive vegetation damage where the clearing area boundaries may have expanded to exceed the working limits, causing unnecessary damage to vegetation. This is a noncompliance with Stipulation 2.6.2.1 of the Grant and Lease. Both sites have clearing areas that may be excessive for the amount of material that can be mined under the current material sales contracts. These areas appear to extend beyond the working limits of Alyeska's current mining plan, which doesn't meet their mining plan requirements.

Up-to-Date Records. JPO found deficiencies with material sites paperwork maintained at the pump stations. Twenty-three current material sale contracts and five current mining and reclamation plans were missing from the operations material site files. The material sale contracts do not require that a current copy of the contracts or mining and reclamation plans be retained at the pump stations. However, these documents provide invaluable information to the maintenance coordinators when writing pipeline work permits for material extraction, and efforts in meeting the terms of the contracts and mining plans. These deficiencies were remedied soon after the JPO surveillance.

JPO concluded the overall quality of the sites had not significantly changed since the 1997 inspection. Except for the findings noted in the field inspections, JPO found the sites met the requirements for well maintained, high quality mineral material sites. JPO determined Alyeska complied with all Grant and Lease requirements, except for the sites with vegetation damage and steep slopes. Alyeska provided JPO, 1) the results of their field work after they assessed the vegetation damage for the 2 affected sites, 2) an explanation of the reasons for the excessively

cleared areas, and 3) plans for resolving both the material sites vegetation damage and the steep slopes to bring them back into compliance. JPO is reviewing the information.

3. Grant and State Lease Compliance

- Five of the ten stipulations evaluated contained some aspects of noncompliance with the Grant and Lease. The five stipulations containing aspects of noncompliance include 1) Surveillance and Maintenance, 2) Conduct of Operations, 3) Material Sites, 4) Slope Stability, and 5) Construction and Operation. The areas of noncompliance relate to maintaining up-to-date records for both system modifications and civil maintenance and inconsistency between existing conditions and design requirements.
- All areas of noncompliance except the material sites represent recurring deficiencies similar to those found in the 1993 audits of TAPS. Alyeska and JPO have met on the underlying issues and Alyeska has efforts underway to address each. JPO will monitor progress and verify all completed corrections.
- The first two areas of noncompliance overlap substantially with those reported in JPO's CMP Operations Report. Improved change management as well as timely updating of documents and records will improve performance in both TAPS operations and TAPS maintenance.

Approach To Compliance

JPO's view is that issues of noncompliance remain until corrected, but it is fair to say that none of the issues have required the Authorized Officer or State Pipeline Coordinator to issue a formal order to engage corrective action. All are believed to be correctable in the short term, with the exception of the management of change as it relates to pipeline system maintenance.

What is New? Reporting noncompliance with some stipulations of the Grant and Lease in the CMP reports.

What is Not New? Aspects of noncompliance. Before the CMP report process, JPO identified concerns and deficiencies, which Alyeska corrected. Past JPO monitoring reports and letters seldom related issues with specific stipulations. JPO pursues issues under the Grant and Lease proactively with Alyeska to maintain compliance, and uses the strategic approach of compliance partnership. This involves frequent communication, proactive problem resolution and a no surprises approach to achieve oversight objectives. JPO's objectives include:

- Continued safe movement of oil through TAPS,
- Compliance with the Federal Agreement and Grant and State Right-of-Way Lease.
- Adequate spill and response capability,

- Reduction of TAPS risk by requiring knowledge of hardware condition, effective management controls, protection of the environment, and worker safety.

The Grant and Lease stipulations are divided into three categories, General, Environmental and Technical. Most stipulations of the Grant and Lease contain separate elements, or sub-stipulations. Each sub-stipulation is sometimes broken down into even more separate elements. When JPO identifies noncompliance with one or more elements of a stipulation, it doesn't necessarily mean there is noncompliance with the entire stipulation. This report discusses aspects of the stipulations related to pipeline system maintenance that JPO evaluated in 1997 and 1998. Where instances of noncompliance were reported, this report does not imply that all other aspects of the stipulation are compliant. Instances of noncompliance do not have to be widespread or of long standing significance to be noted.

Construction Plans and Quality Assurance Program

Note: To minimize redundancy, all of the issues and findings discussed in Chapter 2 are not repeated here. This chapter reports the status of stipulation compliance. A complete evaluation of all aspects of stipulation compliance is beyond the scope of this report.

Section 9C, of the Federal Agreement and Grant of Right-of-Way, and Section 16C of the State Right-of-Way Lease requires Alyeska to maintain quality determination records of natural resource rehabilitation and tangible property repairs. Alyeska's work pad maintenance records lack the necessary information to document the completion and location of repairs, which JPO considers to be an instance of noncompliance with the Grant and Lease. As a result, Alyeska revised three of their maintenance manuals, the System Integrity Monitoring Manual (MP-166), the Maintenance System Manual (MP-167), and the Surveillance Manual (MS-31). JPO will verify whether 1) the manuals are consistent with one another, since they were not before the revisions, 2) whether Alyeska is in compliance with their Surveillance Manual, and 3) whether missing maintenance information was added to Alyeska's electronic tracking system, Passport.

General Stipulations

1.18 Surveillance and Maintenance

Stipulation 1.18.1. This first stipulation requires the permittee to conduct a surveillance and maintenance program applicable to the subarctic and arctic environment. It should be designed to (1) provide for public health and safety, (2) prevent damage to natural resources, (3) prevent erosion, and (4) maintain pipeline integrity.

The maintenance of Alyeska's electrical work and fire alarm and suppression systems falls under this stipulation. Since the National Electric Code violations were corrected and the fire systems were properly maintained (with only one exception), JPO concluded Alyeska is in compliance with the part of Stipulation 1.18.1, that relates to electrical work, as discussed in chapter 2.

This stipulation does not specify or qualify the amount of civil surveillance and field monitoring instrumentation for the work pad areas between the pump stations and the Valdez Marine Terminal.

As discussed earlier in chapter 2, JPO concludes Alyeska does not fully comply with these aspects of Stipulation 1.18.1. Alyeska disagrees they are in noncompliance, but is working to tighten their procedures and improve their trending. There is general agreement between JPO and Alyeska about what should be done, so JPO is currently less concerned with the actual point of noncompliance, and more concerned with corrective action. The ultimate test of compliance with Stipulation 1.18 will be Alyeska's follow through by pump station and Valdez Marine Terminal personnel in adequately documenting maintenance, monitoring, and surveillance information in the upgraded version of Passport. Civil maintenance and surveillance will remain an area of JPO vigilance.

Stipulation 1.18.3. This stipulation requires maintenance of complete and up-to-date records on pipeline system maintenance activities and specifically references modification of records. (Stipulation 1.18.3 was also noted in the previously released CMP Operations report as an area of noncompliance). JPO surveillances and Alyeska's quality assurance activities showed that modification records, including as-built drawings, were not updated within required time frames. In addition, the work packages JPO reviewed were incomplete. JPO determined that the record keeping of civil maintenance tasks in Alyeska's Passport system was inadequate. This constitutes a noncompliance with Stipulation 1.18.3. JPO informed Alyeska of this noncompliance and will track Alyeska's progress to bring this stipulation into compliance.

Stipulations 1.18.2 and 1.18.4. JPO plans to evaluate the second and fourth aspects, Stipulations 1.18.2 and 1.18.4, in future reports. Stipulation 1.18.2 requires a communication system that ensures the transmission of information necessary for the safe operation of the pipeline. The fiber optics project, discussed in JPO's CMP Operations report, should improve the pipeline communications system once the project is completed and fully operating. Stipulation 1.18.4 involves access roads and airstrips, which JPO did not evaluate this year. However, JPO has no indication of a noncompliance with this fourth aspect of the stipulation.

1.21 Conduct of Operations

Stipulation 1.21.1 requires the permittee to perform all TAPS operations in a safe and workmanlike manner to ensure the safety and integrity of TAPS, and always employ and maintain personnel and equipment sufficient for that purpose. The issues with this stipulation stem from inattention to procedural requirements and poor change management, rather than direct threats to system integrity or safety. The change management issues previously discussed in the CMP Operations Report are inconsistent with operating the system in a safe and workmanlike manner. The turnover of projects without preventive maintenance procedures is another manifestation of this problem. The recent changes in relevant managerial control manuals should address the aspect of this stipulation noncompliance cited in this report. However, JPO believes improvement is needed for the delivery of up-to-date drawings, current maintenance and operating procedures and correct material and parts lists for modified TAPS systems.

2.4 Erosion Control

This stipulation has several elements that address the avoidance and minimization of erosion in and around the pipeline system and related facilities. In 1998, JPO conducted

surveillance and engineering reviews of erosion and its resulting effects in the areas near Pump Stations 1 and 3. The areas included 1) the route of the fuel gas line from Pump Station 1 to Pump Station 4, 2) a culvert washout on Coldfoot Hill, and 3) effects of river and floodplain erosion on the Dietrich River, Chena River, Sag River, Marion Creek, Hess Creek, Jarvis Creek, Darling Creek, Miller Creek, Tazlina River, Tsina River, Glacier Creek, and Abercrombie Creek. A test of Alyeska's compliance in addressing erosion problems will be their success in planning, permitting, funding and implementing necessary repairs in response to the natural occurrence of erosion. JPO has not seen anything to evidence noncompliance with this stipulation. Future monitoring will ensure erosion problems are fixed as they occur.

2.6 Material Sites

This stipulation specifies the permittee must 1) apply to purchase gravel and other construction materials taken from public lands, 2) submit a mining plan for removal, and 3) obtain written approval of the Federal Authorized Officer or the State Pipeline Coordinator at JPO for removal of materials from water bodies or other areas. Material site boundaries are required to blend with surrounding natural land patterns. Regardless of the layout of materials sites, soil erosion and vegetation damage must be minimized.

Of the 72 sites inspected in 1998, all but two were found to comply with all aspects of Stipulation 2.6. Two material sites had an excessive amount of vegetation damage. Both sites, which are shared by the Alaska Department of Transportation and Public Facilities, had clearing areas which may be excessive for the amount of material which can be mined under the current material sale contracts. These areas appeared to extend beyond the working limits as identified in the current mining plans. This is a violation of Alyeska's mining and reclamation plan requirements. Alyeska plans to do on-site inspections and survey work on these two sites to determine if the clearing areas extend beyond the working limits.

JPO found six sites that violated Alyeska's mining and reclamation plans. All sites had side slopes steeper than the maximum measurement listed in the requirements of the mining plans. The noncompliance with the mining plans constitutes a noncompliance with the provisions of the Grant and Lease, which specify that all applicable laws and regulations must be followed.

Technical Stipulations

3.5 Slope Stability

This stipulation specifies that areas subject to mudflows, landslides, avalanches, rock falls, and other types of mass movements shall be avoided where practicable in locating the pipeline. Where it is not practicable, measures shall be taken to prevent the occurrence of or protect the pipeline against the effects of mass movements.

JPO evaluated this stipulation for the entire pipeline system and concluded the factors of safety for the Squirrel Creek south slope are not within the requirements of the design basis. The original design was based on frozen ground, and the slope has thawed since

construction. The Squirrel Creek south slope is not in compliance with stipulation 3.5, regarding protection of the pipeline against the effects of mass movement. Additional work on Squirrel Creek is needed to bring the slopes into compliance with the design basis. JPO recommended that Alyeska provide a corrective action plan to fix the conditions on this slope and bring it into compliance, starting with a risk assessment. In 1999, Alyeska plans to do a risk assessment for the Squirrel Creek slope with JPO's participation.

In addition, the Pump Station 11 slope does not meet the requirements of the design basis. The dynamic factor of safety for this slope is less than 1.0. JPO recommended that Alyeska request a waiver from the design basis to account for the discrepancy of the static safety factor of 1.3 for the Pump Station 11 slope that doesn't meet the specified value of 1.5. Alyeska recently agreed to prepare and request a waiver, and plans to enter it into the design basis for future reference, once it is granted. Alyeska committed to completing the update of the design basis by June 1999.

3.9 Construction and Operation

Stipulation 3.9.1. Compliance with Stipulation 3.9.1 requires that all construction, operation, maintenance, and termination activities in connection with TAPS shall be conducted so as to avoid or minimize thermal and other environmental changes; and to provide maximum protection for the public, fish and wildlife habitat. All working platforms, pads, fills and other surface modifications shall be planned and executed in such a way that any resulting degradation of permafrost will not jeopardize the pipeline foundations. Since the factors of safety for the south slope of Squirrel Creek are not within design basis requirements, this constitutes a noncompliance with the Grant and Lease. Thermistor data shows this slope has thawed, and degradation of permafrost has occurred, which is a noncompliance with the first aspect of this stipulation. This instance of noncompliance is directly linked to and is not distinct from the noncompliance with Stipulation 3.5.

4. Employee Concerns and Audit Item Resolution

The Employee Concerns Resolution Program

An employee concern is an assertion of impropriety or deficiency related to the construction, operation, maintenance or management of TAPS. Employee concerns can affect the quality, safety, environmental protection, and integrity of the pipeline.

A critical part of JPO's oversight is to ensure that employees of Alyeska Pipeline Service Company or employees of Alyeska's contractors can voice their concerns about technical and business practices in an atmosphere that promotes free and open communication. Alyeska established the Employee Concerns Program to investigate, resolve and document employee concerns that were not otherwise being resolved. The program is available to all people working on TAPS, including Alyeska and contractor management, supervisors, and employees and other interested persons. Alyeska has several avenues for the expression of employee concerns. Employee concerns should be promptly investigated to gather and analyze facts to determine a course of future action. The Joint Pipeline Office has a toll-free telephone hotline for the anonymous reporting of concerns.

Employee Concerns Related to TAPS Maintenance.

As discussed in earlier chapters, JPO received several employee concerns related to electrical maintenance and fire alarm and suppression systems. Two concerns were validated.

Electrical Maintenance

Several maintenance related concerns were filed directly with JPO. JPO investigated a concern that not all electrical work received third party inspections, as required. This concern was validated. The State electrical inspector issued six notices of violation for this and other items. Alyeska agreed the electrical deficiencies were a problem, and issued corrective action. The action specified that all new electrical installation work done on TAPS would be inspected by a third party inspector. The violations were corrected and verified by the state electrical inspector. These concerns were all closed. JPO agreed with the corrective action and closed the concern. JPO plans to do a field surveillance later this year to verify the corrections.

JPO investigated another maintenance related concern about electrical work proceeding without a work order at a specific location. This is a noncompliance with the work order requirements of Alyeska's Quality Assurance Program. These concerns were reported directly to JPO. Upon investigation, JPO found the work had been completed in compliance with the Quality Assurance Program. After interviewing Alyeska employees and reviewing work orders and permits, JPO did not validate this concern and closed the case.

A third concern was expressed to JPO that electrical work was completed by individuals that did not have a valid and required Certificate of Fitness. This concern was not validated and JPO closed this case.

Fire Alarm and Suppression Systems

JPO reviewed several employee concerns related to fire alarm and suppression systems on TAPS. One concern was validated, which included the design installation and maintenance of the fire alarm and suppression systems at Pump Station 7 without appropriate permits from the state fire marshall. With one exception, all locations met state fire marshall regulations concerning permits. The exception was Pump Station 7, where one individual on the site had a permit for alarm systems only. Preventive maintenance work orders were completed by individuals without the proper permits or not working under the direction of a permit holder. Pump Station 7 personnel responded their work was an exception to the Alaska Administrative Code for owner maintenance contrary to the policy for the rest of TAPS. Although not required by the state fire marshall, but for purposes of consistency, the pipeline manager directed Pump Station 7 to follow overall TAPS policy and secure the necessary fire system permits. JPO will follow up with surveillances to validate Alyeska's directive and verify that fire system permits were obtained.

Audit Action Item Resolution

Alyeska closed the remaining 1993 maintenance related audit action items. One purpose of JPO's Comprehensive Monitoring Program process is to continually monitor the more significant audit deficiencies to detect recurrence. JPO's concern is that some previously closed audit action items recurred in 1998, such as the six National Electric Code violations discussed in earlier chapters.

TAPS Audits

In 1993, the U.S. Bureau of Land Management (BLM) contracted with Quality Technology Company to conduct an audit of TAPS operations and maintenance. This audit, which was inspired by testimony of TAPS whistle blowers at Congressional oversight hearings, uncovered many systemic deficiencies, including:

- An ineffective Alyeska quality program,
- Questionable electric code compliance, and
- A pipeline that, after 17 years of accumulative modifications, could no longer be shown to be able to withstand major earthquakes or other possible contingencies.

The TAPS owners and Alyeska Pipeline Service Company contracted with Arthur D. Little in 1993, to do an independent assessment of the entire pipeline, which essentially validated the BLM audit. The audit identified several more deficiencies. Most of the problems occurred inside the fences of the pump stations and the Valdez Marine Terminal, rather than along the pipeline itself, where JPO had previously placed monitoring focus. Similarly, few of these deficiencies were environment related, or involved the oil spill contingency plan, two key areas of JPO emphasis.

JPO's CMP Maintenance review shows a trend toward the recurrence of some audit action items. Through ongoing surveillance JPO will continue to monitor Alyeska's progress in preventing the recurrence of these audit items. Although Alyeska closed all maintenance related audit action items, there are still some areas where JPO found some audit items to be recurring:

National Electrical Code Violations

The Alaska Department of Labor electrical inspector found several National Electrical Code violations on TAPS. Electrical work was completed without the required supervision of a journeyman electrician, and third party inspections were not performed for electrical work. Alyeska corrected the violations and JPO verified the corrections. Alyeska made corrective actions to ensure electrical work is being accomplished according to the National Electrical Code. If the cause of these violations remains uncorrected, National Electrical Code violations will continue to occur, repeating audit items identified in the 1993 audits. JPO recommends that Alyeska's quality audits and surveillances vigorously review whether electrical work is indeed inspected, given that this problem has been resistant to solution.

Up-to-Date Maintenance Records

Some records JPO reviewed in Passport lacked the detail of maintenance work that had been completed. The Grant and Lease requires Alyeska to maintain quality records of natural resource rehabilitation and tangible property repairs, and to keep current records of maintenance performed along the pipeline system. Alyeska's records lack the necessary detail to document completed maintenance. This is a recurring audit action item.

Valve Maintenance

Alyeska has not met their goals for significant valve concerns, including below ground valve investigations and the mainline valve maintenance review. This delay is partially due to the reassignment of some key personnel in support of Check Valve 122 and Remote Gate Valve 80 projects. While these programs are important for maintaining integrity of the system in the long term, slippages in these schedules do not present immediate, significant threats to TAPS integrity or safety. However, full commitment of adequate resources will be needed for the future progress of these programs, and to prevent this audit item from recurring.

5. Future JPO Work Commitment

JPO will continue to monitor and evaluate Alyeska's maintenance performance for inclusion in future CMP reports based on TAPS maintenance activities.

New Contractor Compliance

The Alyeska Alliance contractors, Price Ahtna, and Alaska Petroleum Contractors were replaced with a new Alliance contractor, Houston Nana. During future maintenance tasks, JPO will evaluate whether the new contractor's maintenance activities meet approved plans, associated permits, and compliance with the Federal Agreement and Grant and State Right-of-Way Lease.

JPO Oversight for 1999

JPO will continue to closely monitor Alyeska's compliance with the stipulations of the Grant and Lease for TAPS maintenance performance. Future work plans include follow-up surveillances for maintenance tasks completed in 1998 and tasks planned for completion in 1999.

Grant and Lease Compliance

JPO will follow Alyeska's progress in correcting the areas noncompliances with some elements of the stipulations included in the Federal Agreement and Grant and State Right-of-Way Lease. Alyeska has been informed that all areas of noncompliance must be corrected and is working to bring them into compliance.

TAPS Electrical Systems

JPO will monitor new TAPS electrical installations in 1999 to verify that Alyeska has implemented corrective action and resolved the electrical code violations. JPO will do surveillances later this year to verify that 1) new electrical installations undergo third party inspections, and 2) new electrical installation work is completed according to the National Electrical Code. Existing facilities are inspected according to Alaska Occupational Safety and Health Administration regulatory requirements.

Employee Concerns Related to Maintenance

Alyeska has directed their staff to follow TAPS policy and obtain the necessary fire system permits. JPO will follow up with surveillances in 1999 to validate Alyeska's directive and verify that fire system permits were obtained.

Preventive Maintenance

Alyeska changed their engineering procedures so that necessary project documentation accompanies turnover of completed projects to the pipeline operators. JPO will monitor future projects to verify preventive maintenance procedures and required documentation is turned over to pipeline operators for completed projects. JPO will monitor the backlog of overdue preventive maintenance tasks and Priority 03 work orders.

Slope Stability

JPO will complete surveillances for 49 other slopes along the TAPS corridor. Resulting conclusions will be based on Alyeska's 1998-1999 slope stability work plan for the problem areas evaluated in this report. Alyeska completed their risk assessment for the Pump Station 11 slope, and JPO is currently reviewing it. JPO will participate in a risk assessment for the Squirrel Creek slope later this year.

JPO recognizes that Alyeska is currently working to stabilize slopes in problem areas. For example, Alyeska has filled depressions in the ground containing vertical support members on the Squirrel Creek slope. In addition, they completed projects on the Pump Station 11, Squirrel Creek, and Tazlina slopes that centered and leveled the support shoes on the vertical support members. JPO will continue to monitor Alyeska's progress on these sites and others that have required slope stability maintenance, such as Wilber Creek and Coldfoot slopes.

Erosion Control

JPO plans to conduct an assessment of erosion in different locations along the pipeline, and will continue to monitor areas already identified as having erosion problems. The work pad that has been threatened by the erosive forces of the Dietrich River will be one area JPO will closely monitor.

Valve Maintenance

Alyeska has begun to address a wide spectrum of valve issues and is meeting high priority goals with acceptable performance. Other related programs of less concern have fallen short of Alyeska's valve maintenance goals. These programs include below ground valve investigations and the valve maintenance review, including the pump stations and the Valdez Marine Terminal. Reaching these goals will require a renewed commitment by Alyeska and continued oversight by JPO in 1999.

Work Pad Maintenance

Alyeska revised three of their maintenance manuals, the System Integrity Monitoring Manual (MP-166), the Maintenance System Manual (MP-167), and the Surveillance Manual (MS-31). JPO will verify whether 1) the manuals are consistent with one another, since they weren't before the revisions, 2) whether Alyeska is in compliance with their Surveillance Manual, and 3) whether necessary maintenance information was added to the

Passport system. JPO's verification will include pipeline surveillance reports and action tracking.

Material Sites

Since annual material site inspections are required by State and Federal regulations, JPO will conduct another annual inspection of all material sites in 1999. JPO will monitor the progress toward correcting the areas of noncompliance relating to vegetation damage and steep slopes. JPO will verify that pump station files contain current material sale contracts and mining and reclamation plans for each operations material site.